IN THE CLAIMS:

Please amend the claims to read as follows:

1. (currently amended) A device for optically measuring qualities of a substance in ambient light comprising:

at least one translucent wall defining a sample chamber for receiving therein the substance to be measured and defining an axis;

a first channel defining a first meridional plane and including thereon:

at least one radiation source mounted adjacent to the sample chamber, wherein the at least one radiation source includes a first radiation source and a second radiation source, the first radiation source and the second radiation source being axially spaced relative to each other, the first radiation source emits a modulated beam of radiation distinguishable from the ambient light based on said modulation and the second radiation source emits a modulated beam of radiation distinguishable from the ambient light based on said modulation; and

at least one detector angularly spaced about the axis of the sample chamber relative to the first and second radiation sources, wherein the at least one detector includes a first detector, the first radiation source is positioned so that a principle ray emitting therefrom substantially passes onto the first detector, the second radiation source is positioned so that a principle ray emitting therefrom substantially passes onto the first detector, the first detector receives the modulated beams of radiation after passage through the sample chamber and substance to be measured therein, and generates a modulated output signal indicative of the intensity of the radiation of the beams impinging thereon;

a second channel defining a second meridional plane and including thereon;

at least one radiation source mounted adjacent to the sample chamber, wherein the at least one radiation source of the second channel includes a third radiation source that emits a modulated beam of radiation distinguishable from the ambient light based on said modulation; and

at least one detector angularly spaced about the axis of the sample chamber relative to the third radiation source, wherein the at least one detector of the second channel receives the modulated beam of radiation emitted by the third radiation source after passage through the sample chamber and substance to be measured therein, and generates a modulated output signal indicative of the intensity of the radiation of the beam of the third radiation source impinging thereon;

a controller coupled to the first radiation source and the first detector for activating the first radiation source and processing the output signal of the first detector; and

a display coupled to the controller.

2. (original) A device as recited in Claim 1, further comprising a housing defining a recess, and wherein the at least one translucent wall is formed by a vial defining the sample chamber therein, and the first radiation source and first detector are mounted adjacent to the recess.

3. (original) A device as recited in Claim 1, wherein the at least one translucent wall is approximately cylindrical.

4. (previously presented) A device as recited in Claim 1, further comprising at least one oscillator coupled to the at least one radiation source of the first channel for modulating the at least one radiation source of the first channel.

5. (original) A device as recited in Claim 1, further comprising at least one amplifier coupled to the first detector for boosting the output signal and dampening other frequencies.

6. (previously presented) A device as recited in Claim 1, wherein said at least one radiation source of the second channel is angularly spaced about the axis of the chamber relative to the first radiation source.

7. (currently amended) A device as recited in Claim ~~6~~ 1, ~~the second channel further comprising:~~

~~at least one detector angularly spaced about the axis of the sample chamber relative to the third radiation source, wherein the at least one detector of the second channel receives the modulated beam of radiation from the third radiation source after passage through the sample chamber and substance to be measured therein, and generates a second modulated output signal indicative of the intensity of the radiation of the beam impinging thereon~~ wherein the display comprises a display for displaying measurement readings based on the modulated output signals.

8. (currently amended) A device as recited in Claim ~~7~~ 1, further comprising an optical longpass filter positioned in front of the at least one detector of the second channel for separating a fluorescence emission intensity from scattered intensities of the at least one radiation source of the first channel and for reducing stray light.

9. (previously presented) A device as recited in Claim 1, wherein the principle ray of the first radiation source and the principle ray of the second radiation source each extend through the axis onto a central region of the first detector.

10. (previously presented) A device as recited in Claim 1, wherein the first and second radiation sources each comprise a light emitting diode.

11. (currently amended) A device as recited in Claim 1, wherein the at least one translucent wall defining the sample chamber comprises at least one optically refractive wall and wherein the at least one optically refractive wall has a refractive power adapted to focus said modulated beam of radiation emitted from said first radiation source and said modulated beam of radiation emitted from said second radiation source onto said first detector.

12. (previously presented) A device as recited in Claim 11, further comprising a vial defining therein the sample chamber and a recess for removably receiving therein the vial.

13. (currently amended) A device as recited in Claim 11, wherein the substance comprises a field sample, the sample chamber is defined by a conduit allowing ~~a~~ the field sample to flow therethrough, the field sample has a concentration of an impurity ~~is dissolved in the free-flowing substance~~, and the controller is further operative to monitor the concentration of the impurity.

14. (previously presented) A device as recited in Claim 1, wherein the display comprises a display for generating a human readable measurement reading.

15. (previously presented) A device as recited in Claim 1, wherein the modulated beam of the first radiation source is modulated at a first modulation frequency and the modulated beam of the second radiation source is modulated at a second modulation frequency different than the first modulation frequency.

16. (previously presented) A device as recited in Claim 15, wherein the modulated beam of the third radiation source is modulated at a third modulation frequency different than the first modulation frequency and the second modulation frequency.

17. (currently amended) A device as recited in Claim 1, further comprising:

data including a plurality of reference measurements based upon a plurality of different reference samples, each reference sample having a different concentration of an impurity, and

wherein the controller comprises a controller for (i) automatically comparing the modulated output signal from the first detector to at least a portion of the plurality of reference measurements to determine a concentration of ~~the~~ an impurity in the ~~sample~~ substance and (ii) generating an output signal indicative of the concentration of the impurity in the substance.

18. (previously presented) A device for analyzing radiant transmission and scattering of an longated sample, wherein the elongated sample defines an axis, the device comprising:

a first channel defining a first meridional plane having the axis extending therethrough and including thereon at least one radiation source mounted adjacent to the sample, the at least one radiation source incuding a first radiaion source for emitting a first beam of radiation through the sample and a second radiation source for emitting a second beam of radiation through the sample, the first radiation source and the second radiation source being axially spaced relative to each other, and at least one sensor angularly spaced about the axis of the sample relative to the first radiation source for generating a first output signal indicative of the intensity of radiation impinging thereon, the at least one sensor including a first sensor for detecting radiation impinging thereon, the first radiation source being positioned so that a principle ray emitting therefrom substantially passes onto the first sensor, the second radiation source being positioned so that a principle ray emitting therefrom substantially passes onto the first sensor; and

a second channel defining a second meridional plane having the axis extending therethrough and including thereon at least one radiation source mounted adjacent to the sample, the at least one radiation source of the second channel including a third radiation source for emitting a third beam of radiation through the sample, and at least one second sensor angularly spaced about the axis of the sample relative to the third radiation source for generating a second output signal indicative of the intensity of radiation impinging thereon.

19. (previously presented) A device as recited in Claim 18, wherein the first radiation source and the second radiation source each includes a light emitting diode positioned so that a principle ray emitting therefrom substantially passes through the axis of the sample and onto the first sensor.

20. (previously presented) A device as recited in Claim 18, wherein the first and third radiation sources are selected from the group including green, red, yellow, orange, blue and nearinfrared light emitting diodes.

21. (original) A device as recited in Claim 18, wherein the first and second channels are angularly spaced approximately 45° apart.

22. (previously presented) A device as recited in Claim 18, further comprising a third channel defining a third meridional plane extending through the axis and including thereon at least one radiation source mounted adjacent to the sample, the at least one radiation source of the third channel including a fourth radiation source for emitting a fourth beam of radiation through the sample, and at least one third sensor angularly spaced about the axis of the sample relative to

the fourth radiation source for generating a third output signal indicative of the intensity of radiation impinging thereon.

23. (original) A device as recited in Claim 18, wherein the second and third channels are angularly spaced approximately 45° apart and the first and third channels are angularly spaced approximately 90° apart.

24. (currently amended) A device as recited in Claim ~~18~~ 22, further comprising a fourth channel defining a fourth meridional plane extending through the axis and including thereon at least one radiation source mounted adjacent to the sample, the at least one radiation source of the fourth channel including a fifth radiation source for emitting a fifth beam of radiation through the sample, and at least one fourth sensor angularly spaced about the axis of the sample relative to the fifth radiation source for generating a fourth output signal indicative of the intensity of radiation impinging thereon.

25. (currently amended) A device as recited in Claim ~~18~~ 24, wherein the first and fourth channels are angularly spaced approximately 22.5° apart.

26. (original) A device as recited in Claim 18, wherein the axis lies within the first meridional plane.

27. (original) A device as recited in Claim 26, wherein the axis lies within the second meridional plane.

28. (currently amended) A device as recited in Claim 18, ~~wherein the at least one translucent wall comprises~~ further comprising a translucent cell for receiving the sample; and wherein the translucent cell defines an optically refractive element adapted to focusing the first beam of radiation on the first detector.

29. (previously presented) A device as recited in Claim 28, wherein the first radiation source comprises a light source for emitting a cone of light and the translucent cell defines the only refractory element disposed along a light path between the first radiation source and the first sensor.

30. (currently amended) A device as recited in Claim 29, further comprising:

a controller coupled to the first sensor; and

a display for converting an output of the controller into a human readable form.

31. (previously presented) A device as recited in Claim 28, wherein the first radiation source comprises a light emitting diode.

32. (currently amended) A device as recited in Claim ~~28~~ 18~~wherein the controller comprises a controller for automatically comparing the first output signal of the at least one sensor which is indicative of a degree of transmittance to a database of stored values in order to determine a concentration of an impurity based on such comparing~~ further comprising electronics for activating each of the channels and processing the first and second output signals generated thereby.

33. (currently amended) A device as recited in Claim 18, wherein the at least one sensor ~~for detecting radiation~~ of the first channel further detects radiation that is emitted from the at least one ~~second~~ radiation source of the second channel and scattered through the sample.

34. (currently amended) A device as recited in Claim 28, wherein the translucent cell is a conduit for receiving the ~~material~~ sample therethrough.

35. (previously presented) A device as recited in Claim 28, further comprising a beam-splitter positioned in front of the first radiation source for directing a portion of the first beam of radiation and for indicating an output power of the first radiation source to thereby monitor performance of the first radiation source.

36. (currently amended) A device as recited in Claim 28, further comprising an amplifier operatively associated with the ~~first~~ at least one sensor of the first channel for boosting the first output signal of the at least one sensor of the first channel.

37. (currently amended) A device as recited in Claim 28, further comprising an oscillator operatively associated with the first radiation source for modulating the first ~~light~~ beam of the first radiation source at a first modulated frequency.

38. (currently amended) A device as recited in Claim 28, further comprising a reagent contained within the translucent cell for mixing with the ~~material~~ sample and creating particles which scatter the light.

39. (currently amended) A device as recited in Claim 28, further comprising a reagent contained within the translucent cell for mixing with the ~~material~~ sample and creating fluorescence.

40. (currently amended) A device as recited in Claim 28, further comprising a reagent contained within the translucent cell for mixing with the ~~material~~ sample and creating an optical absorption band which reduces a transmissivity of the material.

41. (currently amended) A device as recited in Claim 28, further comprising a controller operatively coupled to the first radiation source and first sensor, and wherein the translucent cell

includes an electrical circuit mounted thereon and operatively associated with the controller to provide instructions for ~~testing a material~~ use in analyzing the radiant transmission and scattering of the sample.

42. (previously presented) A device as recited in claim 28, wherein the translucent cell includes a cap attachable thereto for sealing the sample within the cell.

43. (currently amended) A device for optically measuring qualities of a substance in ambient light comprising:

first means defining a sample chamber for receiving therein the substance to be measured and defining an axis;

a first channel defining a first meridional plane and including thereon:

second means mounted adjacent to the sample chamber for emitting a modulated beam of radiation distinguishable from the ambient light based on said modulation;

third means mounted adjacent to the sample chamber for emitting a modulated beam of radiation distinguishable from the ambient light and the modulated beam of the second means based on said modulation, the second means and the third means being axially spaced relative to each other; and

fourth means angularly spaced about the axis of the sample chamber relative to the second means for receiving the modulated beam of radiation of the second means after passage through the sample chamber and substance to be measured therein, and for generating a modulated output signal indicative of the intensity of radiation impinging thereon, wherein the fourth means includes a first detector for detecting radiation, the second means is positioned so that a principle ray emitting therefrom substantially passes onto the first detector, and the third means is positioned so that a principle ray emitting therefrom substantially passes onto the first detector;

a second channel defining a second meridional plane and including thereon:

fifth means mounted adjacent to the sample chamber for emitting a modulated beam of radiation; and

sixth means angularly spaced about the axis of the sample chamber relative to the fifth means for receiving the modulated beam of radiation of the fifth means after passage through the sample chamber and substance to be measured therein, and for generating a modulated output signal indicative of the intensity of radiation impinging thereon; and

~~sixth~~ seventh means coupled to the second and fourth means for activating the second means and processing the output signal of the fourth means.

44. (previously presented) A device as recited in Claim 43, wherein the second means is a radiation source.

45. (previously presented) A device as recited in Claim 44, wherein the radiation source is a light emitting diode and an oscillator connected thereto.

46. (currently amended) A device as recited in Claim 43, wherein the ~~fourth means~~ first detector is a photovoltaic sensor.

47. (currently amended) A device as recited in Claim 43, wherein the ~~sixth~~ seventh means is a microprocessor and memory operatively connected to the second and fourth means.

48. (currently amended) A method for optically measuring qualities of a substance in ambient light comprising the steps of:

providing a sample chamber defining an axis for receiving therein the substance to be measured;

providing a first channel defining a first meridional plane and including thereon at least two radiation sources mounted adjacent to the sample chamber and at least one detector angularly spaced about the axis of the sample relative to the first radiation source for generating a first output signal indicative of the intensity of radiation impinging thereon, the at least two radiation sources including a first radiation source and a second radiation source, the at least one detector including a first detector, the first and second radiation sources being axially spaced relative to each other, the first radiation source being positioned so that a principle ray emitting therefrom substantially passes onto first detector, the second radiation source being positioned so that a principle ray emitting therefrom substantially passes onto the first detector;

emitting modulated beams of radiation from the first and second radiation sources, each of the first and second radiation sources being modulated at a different frequency and, therefore, distinguishable from the ambient light and each other based on said modulation;

providing a second channel defining a second meridional plane and including thereon at least one radiation source mounted adjacent to the sample chamber and at least one detector angularly-spaced about the axis of the sample chamber relative to the at least one radiation source of the second channel;

receiving the modulated beams of radiation by the first detector after passage through the sample chamber and substance to be measured therein;

generating a modulated output signal indicative of the intensity of the radiation of the modulated beams impinging on the first detector;

activating by a controller the first radiation source and the first detector;

processing the modulated output signal; and

providing a display for providing measurement readings based on the modulated output signal.

49. (original) A method according to Claim 48, wherein any angle effects are automatically taken into account by storing a data point based upon a calibration with a pure water sample.

50. (original) A method according to Claim 49, further comprising the step of dampening any signal at the frequency of ambient light.

51. (previously presented) A device as recited in Claim 18, further comprising:

(a) a housing defining a recess for receiving a sample chamber that has at least one memory and is adapted to receive the sample; and

(b) at least one processor to communicate with the at least one memory.

52. (previously presented) A device as recited in Claim 51, wherein the first radiation source is a light emitting diode.

53. (previously presented) A device as recited in Claim 51, wherein the first sensor is a photovoltaic detector.

54. (previously presented) A device as recited in Claim 51, further comprising:

at least one oscillator within the housing and operatively connected to the first radiation source; and

a power cell within the housing for driving the at least one oscillator.

55. (previously presented) A device as recited in Claim 54, further comprising said sample chamber and wherein said sample chamber further includes a base having a printed circuit board that supports the at least one memory.

56. (currently amended) A device as recited in Claim 43, wherein the sample chamber comprises a removable sample chamber for receiving therein a sample of the substance and having at least one memory; and

wherein the ~~device further comprises~~ seventh means is in communication with the at least one memory ~~of the first means and in further communication with the fourth means, for receiving a signal from the fourth means based upon a sample within the first means~~.

57. (currently amended) A device as recited in Claim 56, wherein the first means comprises a vial.

58. (previously presented) A device as recited in Claim 56, wherein the second means comprises a light emitting diode and the first detector comprises a photovoltaic detector.

59. (previously presented) A device as recited in Claim 56, wherein the at least one memory comprises random access memory and read only memory.

60. (previously presented) A device as recited in Claim 56, wherein the seventh means comprises a microprocessor and a software program.

61. (previously presented) An instrument for analyzing color and scattering of a sample, wherein the sample defines an axis, the instrument comprising:

first means for defining a first meridional plane and including thereon second means for emitting a beam of radiation modulated at a first frequency, the second means mounted adjacent to the sample for emitting said beam of radiation through the sample, third means for emitting a beam of radiation modulated at a second frequency that is different than the first frequency, the third means mounted adjacent to the sample for emitting said beam of radiation through the sample, the second means and the third means being axially spaced relative to each other, and fourth means for sensing angularly spaced about the axis of the sample relative to the second means and including a detector for sensing radiation, the second means being positioned so that a principle ray emitting therefrom substantially passes onto the detector, the third means being positioned so that a principle ray emitting therefrom substantially passes onto detector, the fourth means generating a first output signal indicative of the intensity of radiation impinging thereon;

fifth means for defining a second meridional plane and including thereon sixth means for emitting a beam of radiation, the sixth means mounted adjacent to the sample for emitting said beam of radiation through the sample, and seventh means for sensing angularly spaced about the axis of the sample relative to the sixth means for generating a second output signal indicative of the intensity of radiation impinging thereon; and

eighth means for activating the first and fifth means and processing said output signals generated thereby.

62. (previously presented) An instrument as recited in Claim 61, wherein the eighth means activates the second and sixth means simultaneously and corresponding signals generated thereby are distinguishable.